

Volatile Compounds Produced by Irradiation of Commercial Hams and Frankfurters

A.S. Leaflet R1994

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Summary and Implications

Low-dose irradiation (1.6 kGy) of commercially-produced cured, sliced ham and frankfurters resulted in off-odors and off-flavors following the irradiation treatment. Lipid oxidation was not affected by irradiation but gas chromatography/mass spectrometry analysis showed that several new volatile compounds were produced in the products by irradiation processing. These included heptane, trans-1-butyl-2-methylcyclopropanone, 2-octene toluene and 2-butanone. Changes in odor and flavor of irradiated ham and frankfurters resulting from production of volatile compounds must be controlled before irradiation will be accepted by the industry or by consumers as a means of improved the microbial safety of these products.

Introduction

Low-dose irradiation has been clearly demonstrated to be a highly effective method for reduction and/or elimination of pathogenic microorganisms from processed meats. However, there have been several reports of off-odors and off-flavors produced by irradiation treatments. Quality changes from irradiation appear to be closely related to the irradiation dose and consequently, reduced dosage should reduce the amount of quality change. Therefore, this research was initiated to determine the effects of very low dose irradiation (1.6 kGy) on quality of commercial sliced ham and frankfurters.

Materials and Methods

Four separate lots of sliced, cured ham and smoked frankfurters were obtained from a major commercial meat processing firm. All products were repackaged at the Iowa State University Meat Laboratory, prior to irradiation. Packages were randomly assigned to 0 kGy or 1.6 kGy irradiation treatments. Following irradiation, packages were stored at 2-4°C until

evaluation. Each product was evaluated for purge loss, color changes, lipid oxidation, sensory panel odor and flavor differences, and changes in volatile compounds. Evaluations were conducted at 14-day intervals during 8 weeks of storage.

Results and Discussion

Irradiation treatment at a very low (1.6 kGy) dose did not affect the color or the lipid oxidation of either the ham or the frankfurter samples. Because these quality characteristics have been reported to be changed by irradiation, these results imply that the 1.6 kGy dose may be low enough to minimize color and lipid oxidation effects. However, off-odor scores by panelists were higher for irradiated ham samples compared with unirradiated samples. Flavor of ham samples was unaffected. For frankfurters, the irradiation treatment resulted in greater off-flavor scores but odor was not affected. Analysis of volatile compounds showed that irradiation of ham samples resulted in production of heptane, trans-1-butyl-2-methylcyclopropanone, 2-octene and toluene, none of which were detected in unirradiated samples. In frankfurters, irradiation resulted in 2-butanone which was not found in unirradiated samples. In addition, many of the volatiles that were observed in unirradiated ham and frankfurters were increased following irradiation. Therefore, even at very low irradiation doses, the development of new volatile compounds and the generation of off-odors and off-flavors remain a concern for irradiation treatment of processed meats and needs to be controlled before irradiation of these products is likely to be accepted by consumers.

Acknowledgement

Support for this project from the Illinois Council for Food and Agriculture Research is gratefully acknowledged.